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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/067,029	02/04/2002	Narayan Sundararajan	884.594US1	4992
21186	7590	06/29/2004	EXAMINER	
SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402			STRZELECKA, TERESA E	
			ART UNIT	PAPER NUMBER
			1637	

DATE MAILED: 06/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/067,029

Applicant(s)

SUNDARARAJAN ET AL.

Examiner

Teresa E Strzelecka

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 01 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 18, 19 and 21-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 18, 19 and 21-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

1. This office action is in response to an After Final amendment filed June 1, 2004. Claims 4-13 and 18-31 were previously pending, with claims 5, 20 and 25 withdrawn from consideration. Applicants cancelled claims 4-17, 20 and 24-31. Claims 18, 19, 21-23 are pending and will be examined.
2. Applicants' claim cancellations obviated the following rejections: rejection of claims 4, 6-9, 11-13, 24, 26-28, 30 and 31 under 35 U.S.C. 102(e) over Margrave et al. and rejection of claims 10 and 29 under 35 U.S.C. 103(a) over Margrave et al. and Fisher et al.
3. This office action is made non-final because of new grounds for rejection.

#### ***Claim interpretation***

4. Before proceeding with the rejections, interpretation of claim limitations is provided.

A) Modification of a friction coefficient of a nanotube is interpreted as resulting from changing the chemical composition of a nanotube. Any such chemical composition change will result in modification of a frictional coefficient, according to Applicants' definition of a frictional coefficient: "A friction coefficient, by definition, describes forces of interaction between at least two objects or surfaces. A friction coefficient can be described as including both an abrasive component, and an adhesive component. Abrasive friction is defined as primarily a mechanical interaction between two objects. In one example of abrasive friction, resistance to movement at an interface between two objects is generated by asperities on the surface of the objects rising past each other or breaking off. In contrast, adhesive friction is defined as primarily a chemical interaction between two objects. A friction coefficient may be determined either by abrasive factors, adhesive factors, or a combination of the two." (specification, page 2, lines 25-30; page 3, lines 1-3).

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The limitations of increasing or decreasing a frictional coefficient of nanotubes refer to a measurement of a relative quantity, i.e., the same chemical modification of a nanotube measured against two different chemical surfaces may result in either decrease or increase in the friction coefficient.

Since any chemical modification changes friction coefficient of a nanotube, the steps of modifying a frictional coefficient of a nanotube and attaching the nanotube to a reactive molecule are interpreted as being the same step. Therefore, attaching a functional group to a nanotube will inherently either increase or decrease its frictional coefficient, depending against which substrate the frictional coefficient is measured.

Therefore, the limitation of increasing or decreasing the frictional coefficient of the nanotube does not add any additional structural limitations to the product claims.

B) A limitation of claim 19, "an assay molecule", is interpreted as any molecule, since it was not defined in the specification.

C) The definitions of the terms "reactive molecule" and "chemical modifier" were not defined by Applicants, therefore they are interpreted as any molecules.

### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 18, 19 and 21-23 are rejected under 35 U.S.C. 102(e) as being anticipated by Dai et al. (U.S. Patent No. 6,528,020 B1).

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Regarding claim 18, Dai et al. teach a molecular identification assembly comprising:

a reactive molecule (Dai et al. teach a nanotube device comprising electrodes, therefore, they teach reactive molecules which constitute the electrodes. The electrodes can be nickel-gold or titanium-gold, therefore the reactive molecules are gold, zinc and titanium (col. 2, lines 17-20; col. 4, lines 29-32).)

a carbon nanotube attached to the reactive molecule (Dai et al. teach a nanotube device comprising electrodes deposited on both ends of a carbon nanotube (col. 2, lines 15-20; col. 4, lines 23-34).); and

a chemical modifier attached to a portion of the carbon nanotube separate from the reactive molecule, the chemical modifier altering the friction coefficient of the carbon nanotube (Dai et al. teach modifying the nanotube by coating or decorating it with one or more sensing agents (= chemical modifiers), such as metal particles, polymers and biological species. In particular, Dai et al. teach deposition of gold onto the nanotube and attachment of thiol groups to gold. Thiol is modified with carboxylic functional group (col. 2, lines 28-32; col. 5, lines 32-43 and 51-63; Fig. 5 and 7A). Therefore, since Dai et al. teach attachment of molecules to the nanotube, they teach attachment of chemical modifiers, which inherently change the friction coefficient of the nanotube.).

Regarding claim 19, Dai et al. teach an assay molecule, since they teach gold, zinc or titanium electrodes, therefore they teach molecules of gold, titanium and zinc (col. 2, lines 17-20; col. 4, lines 29-32). Since Applicants did not define the term "assay molecule", these molecules are considered to be assay molecules.

Regarding claim 21, Dai et al. teach thiol molecules (= chemical modifier) with carboxylic functional groups (col. 5, lines 51-63).

Regarding claims 22 and 23, Dai et al. teach attachment of chemical modifiers to the nanotube, therefore, as explained in the "Claim interpretation" section, they inherently teach increasing or decreasing the frictional coefficient of the nanotubes.

7. No claims are allowed.

***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Bolskar et al. (US 2003/0220518 A1).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Teresa E Strzelecka whose telephone number is (571) 272-0789. The examiner can normally be reached on M-F (8:30-5:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Benzion can be reached on (571) 272-0782. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TS  
June 22, 2004

  
JEFFREY FREDMAN  
PRIMARY EXAMINER